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Description

Adapter for Installation of
Toilet Flushing Apparatus

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Technical Field

The present invention is directed to an adapter that may be affixed, to or incorporated into, a toilet flushing apparatus for ease of installation.

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Background of the Invention

A variety of toilet flushing devices are available commercially for replacement of an existing device for repair purposes or for water conservation. These devices are positioned between the toilet water tank and the toilet bowl. Replacement of an existing flushing device whether for repair or to install a new water conserving device often requires disassembly of the toilet. Such disassembly requires that the user turn the valve supplying water to the toilet tank to the "off" position, removal of the water in the tank and unbolting the tank from the bowl. Depending on the knowledge and experience of the installer this could take a substantial amount of time and could result in damage to the existing tank or bowl as well as to the floor beneath the tank in the event water escapes during disassembly. For example patent application WO 91/12381 describes a water saving dual valve toilet flushing apparatus. The device functions by allowing the user to select the amount of water used to clear the toilet bowl by operation of the flushing handle. More specifically, when the handle is pushed downward a valve closer to the top of the water

tank is activated releasing only a portion of the water maintained in the tank. If a larger volume of water is desired the user pushes the handle upward which activates a valve at or near the based of the tank releasing most
5 if not all of the water available in the tank to clear the bowl. As with many of the flushing devices available on the market today the dual valve toilet flushing apparatus comprises a threaded base for installation in an existing toilet. Correspondingly the user is required
10 to disassemble the tank to install the new flushing apparatus.

In view of the technical skill required to disassemble a toilet, the time required to complete an installation of this type, the potential for damaging the
15 toilet tank and or the bowl during the disassembly operation and the almost inevitable escape of residual water from the tank that may damage personal property there is a need for an adapter that will allow for easy replacement of the flushing apparatus without disassembly
20 of the toilet for proper installation.

Summary of the Invention

The adapter of the present invention may be provided separately, affixed to a toilet flushing apparatus or be
25 integral to the bottom of a toilet flushing apparatus.

In one embodiment the adapter comprises a generally tubular body having a top, a bottom, an internal surface and an external surface, said top internal surface having means for affixing to the base of a toilet flushing
30 apparatus said bottom having at least two descending legs wherein said at least two legs having a locking means for securing said apparatus within a toilet.

In a preferred aspect of this embodiment the adapter may have two, three or four semi-flexible legs. The legs have an upper portion closer to the generally tubular body bottom and a base distant from the body bottom. The
5 locking means is preferably a snap-clip located at said base of the legs.

In other embodiments the adapter is affixed to a toilet flushing apparatus or the adapter may be integral to the central riser of a toilet flushing apparatus. In
10 the latter case, the central riser comprises a generally tubular main body, having a top, a bottom, a first outlet port on said top, a second outlet port on said main body near said bottom said second outlet port spaced vertically apart from said first outlet port and an
15 overflow tube extending out from said main body near said top generally parallel with said main body, said first outlet port able to receive a first stopper affixed to said top, said second port able to receive a second stopper affixed to said main body and a means for
20 affixing a stopper activation means to said main body and said bottom having at least two descending legs, said legs having locking means to secure said central riser within a toilet tank.

In a preferred aspect of this embodiment the adapter
25 may have two, three or four semi-flexible legs. The legs have an upper portion closer to the generally tubular main body bottom and a base distant from the main body bottom. The locking means is preferably a snap-clip located at said base of the legs.

Brief Description of the Drawings

Figure 1 Illustrates an adapter on the present invention for installation of a toilet flushing apparatus, (A) the top view, (B) a cross sectional side view (C) a bottom view and (D) the cross sectional side view of B rotated 90°; and

Figure 2 Illustrates a dual valve flushing apparatus tower comprising an adapter of the present invention, (A) a cross sectional side view, (B) a top view and (C) a bottom view.

Detailed Description of the Invention

Prior to setting forth the invention, it may be helpful to an understanding thereof to first set forth definitions of certain terms that will be used herein after. These terms will have the following meanings unless explicitly stated otherwise:

The term "toilet flushing apparatus" refers to a device for controlling the release of liquid into a toilet bowl from the toilet tank.

The term "tubular" refers to a cylindrical geometrical shape in which the interior is hollow. The term "generally tubular" means that while the shape is hollow it is not necessarily cylindrical.

The term "affixing" refers to physically attaching one item or element to another by any means such as for example, clip, snap-fit, or press-fit.

The term "securing" refers to affixing an item or element to another in a strong, stable, or firm manner such as for example by adhesive or threads.

The term "semi-flexible" refers to the ability of a material or a portion of an item or element to be

reversibly bent, or pliable.

The term "parallel" refers to the orientation of one item or element in relation to another item or thing as usually being side-by-side and in line with one another such that the distance between them is the same over the length of the item or element in question. The term "generally parallel" is used to indicate that while the items are side-by-side and in line with one another the distances between them may not be the same over the length of the item or element.

The adapter of the present invention includes a separate device that may be affixed to a existing flushing apparatus or an integrated device in which the adapter may be formed as an integral part of a flushing apparatus, such as for example a toilet flushing apparatus comprising the adapter at its base in a single form molded piece.

The Adapter

The adapter 10 of the present invention may be used to simplify replacement of a broken toilet-flushing apparatus or to install a new water saving toilet-flushing apparatus. The adapter 10 comprises a generally tubular body 11 having a top, a bottom, an internal surface and an external surface. The top internal surface is able to be affixed to the base of a toilet flushing apparatus and the bottom has at least two descending legs 12 each having a locking means 16 for securing the apparatus within a toilet.

The adapter 10 has a generally tubular body 11. The exterior of the body 11 is preferably cylindrical, however one skilled in the art would recognize that a variety of shapes maybe selected if desired. For example,

the top external surface may have a shape that allows the adapter 10 to be installed on the toilet flushing apparatus with a wrench and consequently, may have a hexagonal surface. Correspondingly, the top exterior surface may comprise a gripping means such as a textured surface for firmly and securely grasping the adapter 10 while affixing it to the apparatus.

A variety of methods may be utilized by one skilled in the art to affix the adapter 10 to the toilet flushing apparatus, for example the internal surface of the body 11 may be smooth to allow affixing of the toilet flushing apparatus by press-fitting. In such a configuration the joint may further be secured with glue or adhesive. Correspondingly, the surface may be threaded to allow the adapter 10 to be affixed to the apparatus by screwing. Furthermore, the internal diameter of the body 11 may be provided to accept a single or specific type of toilet flushing apparatus or may be provided in a form able to accept several different types of toilet flushing apparatus.

The internal surface of the adapter 10 at the bottom may further comprise a ledge 19 along its perimeter to provide a seat for the base of the toilet flushing apparatus. The ledge 19 may further comprise a seat to accommodate a washer such that when the adapter 10 is tightened onto the apparatus the base of the apparatus presses firmly against the washer forming a watertight seal. Alternatively, the washer seat may be provided along the interior surface of the body 11 near the bottom such that a watertight seal is formed along the internal surface of the adapter 10 when the apparatus is affixed thereto. One skilled in the art would recognize that a

variety of methods may be utilized to form a watertight seal between the adapter 10 and the apparatus. For example, teflon™ tape maybe applied to the threads of the apparatus before affixing the adapter 10.

5 In the preferred embodiment, the length of the body 11 is not less than 1 inch and not more that 3 inches, the outer diameter (OD) is about 2.25" and the walls are about 0.0625" thick.

The bottom of the adapter 10 is provided with at
10 least two legs 12 with locking means 16 for inserting and securing the adapter 10 within the exit port of the toilet tank. Preferably the adapter 10 has two, three or four legs 12. The legs 12 extend from the bottom of the
15 adapter 10 to accommodate the exit port walls. The inset distance will vary depending on the exterior diameter of the apparatus being affixed to the adapter 10 but is preferably not less than 1/8 inch and not more than 1/2
20 inch. The length of the legs 12 will vary depending on the depth of the exit port between the toilet tank and bowl but are preferably not less than 1 inch and not more than 5 inches. The legs 12 of the adapter 10 must be sufficiently flexible to allow the installer to compress and insert them into the exit port. Consequently, the
25 width of the legs 12 will depend on the curvature imposed on the leg 12 by the generally tubular shape of the body 11 and the material used to construct the adapter 10. The more curvature to the leg 12 the more difficult it may be to compress for installation. Correspondingly, the
30 rigidity of the material used to prepare the adapter 10 will effect the flexibility of the legs 12. Consequently,

one skilled in the art can determine the width of the legs 12 based on the material selected for preparing the adapter 10 and the diameter of the body 11 desired. The exterior surface of the legs 12 may be provided in a variety of shapes such as for example smooth and straight or contoured to compliment the interior surface of the exit port.

The legs 12 also comprise a locking means 16 at their base distant from the adapter bottom, that secures the adapter 10 in place within the exit port. There are a variety of means known to those skilled in the art for locking such an adapter 10 within a generally tubular opening such as an exit port. Preferably this locking means 16 is a snap-clip type comprising a ridge 16 formed on the exterior side of the leg 12 being generally perpendicular to the adapter body extending outward from the exterior surface a distance not less than 1/16 inch and not more than 1/2 inch. When installed this ridge 16 firmly grasps the rim of the base of the exit port, the rim facing the toilet bowl, securing the apparatus in the toilet tank.

The terminus of the legs 12 below the snap-clip ridge 16 may be provided in a wedge shape wherein the edge of the wedge is closer to the interior surface than to the exterior surface of the leg 12 and forming a diameter slightly less than the diameter of an exit port. Such a wedge shape at the terminus of the legs 12 would reduce the necessity of compressing the legs 12 to allow insertion of the adapter 10 into the exit port.

In addition, a portion of the bottom of the adapter 10 may be inset with the legs 12. Preferably, the inset

does not exceed $\frac{1}{2}$ inch up from the bottom of the body 11. The ridge formed by the inset may further comprise a seat along the perimeter for accommodating a watertight flexible washer. In this configuration the distance
5 between the inset ridge on the body 11 and the snap-clip ridge 16 on the legs 12 is just slightly longer than the length of the exit port between the toilet tank and bowl. In this configuration, the washer is slightly compressed between the adapter body 11 and the toilet tank to allow
10 the snap clips to lock in place exerting pressure on the washer thereby forming a watertight seal between the tank and the adapter 10.

Central Riser with Adapter

The central riser 18 of a toilet flushing apparatus
15 may be produced with an adapter integral to its base. The central riser of a toilet flushing apparatus provides the outlet ports for directing a specific volume of liquid from the toilet tank to the bowl. The first outlet port 20 maybe removably covered by a first stopper 26 and the
20 second outlet port 22 maybe removably covered by a second stopper 28. The first stopper 26 may be a conventional flapper stopper and may be conventionally mounted to the overflow tube for sealing first outlet port 20. For example, a pair of first studs 27 can be provided which
25 extend out on each side of the outlet port 20 so that a pair of oppositely disposed apertures on the first stopper 26 fits over the first studs 27 so that the first stopper 26 pivots about the first studs 27. Alternatively, the overflow tube can be sized to
30 accommodate the mounting ring that is typically provided by the conventional flapper stoppers. The second stopper

28 may be mounted about a pair of second studs 29 similar to the first stopper 26. The studs 27, 29 may be molded as a part of the central riser 18. In the preferred embodiment, the studs 27, 29 protrude out about $3/8''$, and have a diameter of about $1/8''$.

When an outlet port 20, 22 is opened, the flushing liquid inside the tank is evacuated through the opened outlet port 20, 22 and flows out to the exit port. The flushing liquid is replenished in the tank, via conventional means well known to those skilled in the art, after each time the flushing liquid level drops below a certain level.

The opening and the closing of the outlet ports 20, 22 is controlled by a stopper control mechanism which controls the raising and lowering of the first and second stoppers 26, 28 in response to the rotation of the flush handle.

The pivot point 34 is located on the central riser 18 between the first and second outlet ports 20, 22 and protrudes therefrom. In the preferred embodiment, the pivot point 34 protrudes out about $3/8''$ and is a stud about $1/8''$ wide. A linkage arm utilized to activate the stoppers is held in place around the pivot point 34 by conventional means such as a press fit cap which snaps or friction fits over the pivot point 34.

The first outlet port 20 is located on top of the central riser 18 directly above the exit port so that when the first outlet port 20 is opened, and the flushing liquid is evacuated through the first outlet port 20, the liquid flows out in a substantially vertical direction and directly as possible into the exit port. In the

preferred embodiment the first outlet port 20 is positioned directly above the exit port to maximize the flush pressure during evacuation. The direct path maximizes the fluid pressure as the liquid travels to the exit port.

Similarly, in the preferred embodiment, the body of the second outlet port 22 is as short as necessary to provide structure to mount the second stopper 28 as close as possible to the bottom of the central riser 18, near the exit port and also at an angle which provides a direct path from them mouth of the exit port.

In addition, the second outlet port 22 is mounted such that a direct, substantially vertical line can be drawn from the top to the bottom of the central riser 18 and directly in to the mouth of the exit port. When liquid is exiting the second outlet port 22, the maximum fluid force is a vertical path commencing at the upper edge of the second outlet port 22 and ending inside the exit port. The maximum force path inherently sets up a barrier, which directs the lower velocity parts of the fluid flow entering the second outlet port 22 to also flow downward into the exit port. Hence, in the preferred embodiment, the second outlet port 22 is positioned such that the liquid exiting the second outlet port 22 does not flow backwards and up into the central riser 18.

The second outlet port 22 is located close to the exit port in order to reduce the distance that the liquid has to travel, from the mouth of the second outlet port 22 and down the central riser 18 to the exit port, and also so that substantially all of the flushing liquid in the tank is discharged through the second outlet port 22

when the port 22 is opened. Locating the second outlet port 20 close to the exit port also reduces the occurrence of liquid back flow up the central riser 18, which may unseat the first stopper 26. In addition, the length of the second port body is selected to be minimal so that the path length that the flush liquid has to travel from the mouth of the second outlet port 22 to the body of the central riser 18 is minimal.

In the preferred embodiment, the second outlet port 22 is also located on top of the second outlet body 23 and the second outlet body 23 extends out from the central riser 18 at about a 45° angle to provide a direct, linear path for the liquid to flow directly into the exit port. However, the angle may be varied, based upon the length of the second outlet port body 23, location of the second outlet port body on the central riser 18, or the location of the second outlet port 22, is such that when the second outlet port 22 is opened, the flush liquid travels in a direct, linear path into the exit port, thereby maximizing the pressure flow of the flush liquid from the outlet port 22 to the exit port. However, the more horizontal that the second stopper 28 is mounted, the easier it is to seat the stopper 28 and the greater the volume of flush liquid that can be evacuated.

To further maximize the flow pressure of the flush liquid during evacuation, the diameters of the central riser 18, the first outlet port 20, and the second outlet port 22 are each selected to be about equal to, or greater than, the diameter of the exit port.

The central riser 18 has a pair of shoulders 54 at

its base which, in the preferred embodiment, extend out 5/8" to accommodate an inner washer located between the shoulder 54 and the exit port to form a seal between the shoulders 54 and the exit port inside of the tank. The exit pipe is the portion of the central riser 18 beneath the shoulders 54 which fits into exit port at the base of the toilet tank. In one embodiment, the adapter comprises at least two legs, preferably two legs, and an inner diameter (ID) of 2 inches and a height of 1.5 inches. The washer is held in place, to form a watertight seal, by pressing the central riser 18 into the exit port until the locking means snap clip into place.

In the preferred embodiment, the body of the central riser 18 has a 2.25" outer diameter (OD), is about 5.5" high, and has walls 0.0625" thick. The outer diameter of the first outlet port 20 and of the second outlet port 22 are 2.25". Hence, the first stopper outlet port 22 are 2.25". Hence, the first stopper 26 and the second stopper 28 have a 2.25" OD.

20 Installation

The adapter 10 may be installed separately or affixed to a toilet-flushing apparatus prior to installation. If installed separately the legs 12 of the adapter 10 are compressed slightly and by an amount sufficient to insert the legs 12 into the exit port. The adapter 10 is then pressed into the exit port. When the snap-clip ridge 16 meets the end of the exit port the pressure on the legs 12 is released as the ridge 16 snaps into position locking the adapter 10 within the exit port.

Preferably a portion of the bottom of the adapter 10

is inset forming a ridge in which a washer seat may be provided. Prior to installation a flexible watertight washer is fitted into, or provided within, the washer seat near the bottom of the adapter 10. Upon installation the adapter legs 12 are inserted into the exit port, the snap-clip ridge 16 exerting pressure against the interior surface of the exit port until the washer comes in contact with the toilet tank. The adapter 10 is then secured in place by exerting sufficient pressure to compress the flexible watertight washer providing the remaining distance necessary for the snap-clip ridge 16 to snap into place at the base of the exit port maintaining an amount of pressure on the washer to prevent leakage between the adapter 10 and the toilet tank.

Alternatively the adapter 10 is first affixed to the toilet flushing apparatus prior to installation. In this case the installer affixes the adapter 10 to the apparatus. This may be done by a variety of methods such as by a press fit in which the installer may affix the adapter 10 with adhesive to the apparatus or by screwing the adapter 10 onto the apparatus if both are appropriately threaded. In the latter case, the installer may elect to use teflonTM tape wrapped around the threads of the apparatus before screwing on the adapter 10 to create a watertight seal. Insertion of the apparatus after affixing the adapter 10 is described above.

The adapter 10 as well as the central riser 18 comprising the adapter may be made of a variety of materials known to those skilled in the art that will provide some flexibility to the legs 12 for compression during installation, that is resilient to the use of

tools such as wrenches and resistant to cracking. Such materials include for example polymers or plastics.

Having thus described the invention, it is recognized that those skilled in the art may make various
5 modifications or additions to the preferred embodiments chosen to illustrate the invention without departing from the spirit and scope of the present contribution to the art. Accordingly, it is to be understood that the protection sought and to be afforded hereby should be
10 deemed to extend to the subject matter claimed and all equivalents thereof within the scope of the invention.